

## WHAT IS CLAIMED IS:

1 *Def* 1. An apparatus for terminating an obstructive sleep apnea  
2 event before the cessation of breathing occurs, wherein the  
3 apparatus comprises:

4 at least one microphone capable of being acoustically  
5 associated with a person, said microphone capable of detecting  
6 breathing sounds within an airway of said person and capable of  
7 generating signals representative of said breathing sounds;

8 a controller coupled to said at least one microphone and  
9 capable of receiving said signals, said controller capable of  
10 identifying within said signals at least one signal pattern that is  
11 associated with a breathing pattern of said person that occurs at  
12 the onset of an obstructive sleep apnea event, and capable of  
13 generating an alarm signal in response thereto; and

14 a stimulus generator coupled to said controller, said stimulus  
15 generator capable of receiving said alarm signal from said  
16 controller, and in response thereto, creating a stimulus to cause  
17 said person to move in a manner that causes said obstructive sleep  
18 apnea event to terminate.

1           2.    An apparatus as claimed in Claim 1 wherein said stimulus  
2 generator comprises one of: a sound generator, a light source,  
3 a vibrator, and an electrical current source.

1           3.    An apparatus as claimed in Claim 1 wherein said stimulus  
2 generator comprises a vibrator and a sound generator.

1           4.    An apparatus as claimed in Claim 1 wherein said stimulus  
2 generator comprises a vibrator and an electrical current source.

1           5.    An apparatus as claimed in Claim 1 further comprising a  
2 base station coupled to said controller wherein said controller is  
3 capable of sending an alarm signal to said base station to indicate  
4 that at least one signal pattern has been identified that is  
5 associated with a breathing pattern of said person that occurs at  
6 the onset of an obstructive sleep apnea event before cessation of  
7 breathing occurs.

1 *Sub 2* 6. An apparatus as claimed in Claim 1 further comprising at  
2 least one filter coupled between said at least one microphone and  
3 said controller, wherein said at least one filter is capable of  
4 filtering said signals from said at least one microphone to create  
5 filtered signals representative of said breathing sounds, and  
6 wherein said controller is capable of identifying within said  
7 filtered signals at least one signal pattern that is associated  
8 with a breathing pattern of said person that occurs at the onset of  
9 an obstructive sleep apnea event.

1 7. The apparatus as claimed in Claim 1 further comprising an  
2 airflow sensor capable of detecting a flow of air within an airway  
3 of said person and capable of generating an airflow detection  
4 signal that is representative of the presence of said flow of air;  
5 and

6 wherein said controller is coupled to said airflow sensor and  
7 is capable of receiving said airflow detection signal from said  
8 airflow sensor to obtain information concerning the breathing of  
9 said person.

1 *Shaf* 8. The apparatus as claimed in Claim 1 wherein said  
2 controller comprises software capable of analyzing said signals to  
3 identify within said signals at least one signal pattern that is  
4 associated with a breathing pattern of said person that occurs at  
5 the onset of an obstructive sleep apnea event.

1 9. The apparatus as claimed in Claim 8 wherein said software  
2 analyzes said signals using Fast Fourier Transform analysis.

1 10. The apparatus as claimed in Claim 1 wherein said  
2 controller operates only during one half of the respiration cycle.

1 *Sub*  
2 *A5* 11. An apparatus for terminating an obstructive sleep apnea  
3 event before the cessation of breathing occurs, wherein the  
4 apparatus comprises:

5 at least one microphone capable of being acoustically  
6 associated with a person, said microphone capable of detecting  
7 breathing sounds within an airway of said person and capable of  
8 generating signals representative of said breathing sounds;

9 a controller coupled to said at least one microphone and  
10 capable of receiving said signals, said controller capable of  
11 identifying within said signals at least one signal pattern that is  
12 associated with a partially occluded breathing pattern of said  
13 person, and capable of generating an alarm signal in response  
14 thereto; and

15 a stimulus generator coupled to said controller, said stimulus  
16 generator capable of receiving said alarm signal from said  
17 controller, and in response thereto, creating a stimulus to cause  
18 said person to move in a manner that terminates the partial  
occlusion of breathing and restores normal breathing.

12. An apparatus as claimed in Claim 11 wherein said stimulus generator comprises one of: a sound generator, a light source, a vibrator, and an electrical current source.

13. An apparatus as claimed in Claim 11 wherein said stimulus generator comprises a vibrator and a sound generator.

14. An apparatus as claimed in Claim 11 wherein said stimulus generator comprises a vibrator and an electrical current source.

15. An apparatus as claimed in Claim 11 further comprising a base station coupled to said controller wherein said controller is capable of sending an alarm signal to said base station to indicate that at least one signal pattern has been identified that is associated with a partially occluded breathing pattern of said person.

16. An apparatus as claimed in Claim 11 further comprising at least one filter coupled between said at least one microphone and said controller, wherein said at least one filter is capable of filtering said signals from said at least one microphone to create filtered signals representative of said breathing sounds, and wherein said controller is capable of identifying within said filtered signals at least one signal pattern that is associated with a partially occluded breathing pattern of said person.

17. The apparatus as claimed in Claim 11 further comprising an airflow sensor capable of detecting a flow of air within an airway of said person and capable of generating an airflow detection signal that is representative of the presence of said flow of air; and

wherein said controller is coupled to said airflow sensor and is capable of receiving said airflow detection signal from said airflow sensor to obtain information concerning the breathing of said person.

1 *Sub P 27* 18. The apparatus as claimed in Claim 11 wherein said  
 2 controller comprises software capable of analyzing said signals to  
 3 identify within said signals at least one signal pattern that is  
 4 associated with a partially occluded breathing pattern of said  
 5 person.

1 19. The apparatus as claimed in Claim 18 wherein said  
 2 software analyzes said signals using Fast Fourier Transform  
 3 analysis.

1 20. The apparatus as claimed in Claim 11 wherein said  
 2 controller operates only during one half of the respiration cycle.



1 *Sub 7*  
2 *A8* 21. A method for terminating an obstructive sleep apnea event  
3 before the cessation of breathing occurs, comprising the steps of:  
4 detecting breathing sounds within an airway of a person;  
5 generating signals representative of said breathing sounds;  
6 identifying within said signals at least one signal pattern  
7 that is associated with a breathing pattern of said person that  
8 occurs at the onset of an obstructive sleep apnea event; and  
9 creating a stimulus to cause said person to move in a manner  
that causes said obstructive sleep apnea event to terminate.

1 22. The method as claimed in Claim 21 wherein said step of  
2 creating a stimulus to cause said person to move in a manner that  
3 causes said obstructive sleep apnea event to terminate comprises  
4 one of the steps of:

5 generating a sound with a sound generator, activating a light  
6 source to turn on a light, activating a vibrator, and generating an  
7 electrical current through the body of said person.

23. The method as claimed in Claim 21 wherein said step of creating a stimulus to cause said person to move in a manner that causes said obstructive sleep apnea event to terminate comprises the steps of:

activating a vibrator; and

generating a sound with a sound generator.

24. The method as claimed in Claim 21 wherein said step of creating a stimulus to cause said person to move in a manner that causes said obstructive sleep apnea event to terminate comprises the steps of:

activating a vibrator; and

generating an electrical current through the body of said person.

1 *AS* 25. The method as claimed in Claim 21 further comprising the  
*and*  
2 steps of:  
3 filtering said signals representative of said breathing sounds  
4 to create filtered signals representative of said breathing sounds;  
5 and  
6 identifying within said filtered signals at least one signal  
7 pattern that is associated with a breathing pattern of said person  
8 that occurs at the onset of an obstructive sleep apnea event.

1 26. The method as claimed in Claim 21 further comprising the  
2 steps of:

3 recording said at least one signal pattern that is associated  
4 with a breathing pattern of said person that occurs at the onset of  
5 an obstructive sleep apnea event;

6 monitoring said signals representative of said breathing  
7 sounds as said person breathes;

8 comparing said signals representative of said breathing sounds  
9 with said recorded at least one signal pattern that is associated  
10 with a breathing pattern of said person that occurs at the onset of  
11 an obstructive sleep apnea event; and

12 identifying within said signals a signal pattern that is  
13 substantially the same as said recorded at least one signal pattern  
14 that is associated with a breathing pattern of said person that  
15 occurs at the onset of an obstructive sleep apnea event.

1 27. The method as claimed in Claim 21 wherein the step of  
2 detecting breathing sounds within an airway of said person  
3 comprises:

4 detecting breathing sounds within said airway of said person  
5 only during one half of the respiration cycle.

1 *28* 28. A method for terminating an obstructive sleep apnea  
2 event before the cessation of breathing occurs comprising the steps  
3 of:

4 detecting breathing sounds within an airway of a person;  
5 generating signals representative of said breathing sounds;  
6 identifying within said signals at least one signal pattern  
7 that is associated with a partially occluded breathing pattern of  
8 said person;

9 recording said at least one signal pattern that is associated  
10 with a partially occluded breathing pattern of said person;

11 monitoring said signals representative of said breathing  
12 sounds as said person breathes;

13 comparing said signals representative of said breathing sounds  
14 with said recorded at least one signal pattern that is associated  
15 with a partially occluded breathing pattern of said person;

16 identifying within said signals a signal pattern that is  
17 substantially the same as said recorded at least one signal pattern  
18 that is associated with a partially occluded breathing pattern of  
19 said person; and

20 creating a stimulus to cause said person to move in a manner  
21 that terminates the partial occlusion of breathing and restores  
22 normal breathing.

29. A method for terminating an obstructive sleep apnea event before the cessation of breathing occurs comprising the steps of:

- detecting breathing sounds within an airway of a person;
- generating signals representative of said breathing sounds;
- identifying within said signals at least one signal pattern that is associated with a normal breathing pattern of said person;
- recording said at least one signal pattern that is associated with a normal breathing pattern of said person;
- monitoring said signals representative of said breathing sounds as said person breathes;
- comparing said signals representative of said breathing sounds with said recorded at least one signal pattern that is associated with a normal breathing pattern of said person;
- identifying within said signals a signal pattern that is substantially different from said recorded at least one signal pattern that is associated with a normal breathing pattern of said person; and
- creating a stimulus to cause said person to move in a manner that restores normal breathing.